

# ENGINEERING PHYSICS (EP)

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## EP-235 Computers in Physics 4 Credits

Prerequisites: PHYS-224 and PHYS-225

Minimum Class Standing: Sophomore

The multiple ways computers are used by professionals in industry, academia, and government laboratories are provided. Problems in physics will be solved through analytical or symbolic software tools, numerical approaches implemented in spreadsheets and basic scripts written in a structured style, and experimental tools for control and data acquisition. This combination of symbolic, numerical and experimental work will give students a practical toolbox of techniques to solve new problems and meet challenges in upper level classes, graduate school, and/or postgraduate positions.

Lecture: 2, Lab 4, Other 0

## EP-335 Computational Physics 4 Credits

Prerequisites: PHYS-224 and PHYS-225

Minimum Class Standing: Sophomore

Computational physics is widely regarded as a third branch of physics, complementing both experimental and theoretical approaches. This course introduces the mindset and selected methods of computational physics, in the context of problems from a variety of subfields in physics. Examples include finite difference methods for differential equations, relaxation methods, and stochastic methods such as random walks and/or the Ising model. Tools of programming will be used, though prior knowledge or experience is not required.

Lecture: 4, Lab 0, Other 0

## EP-342 Introduction to Materials Science and Engineering 4 Credits

Prerequisites: PHYS-224 and PHYS-225 and (CHEM-135 or CHEM-137)

Minimum Class Standing: Sophomore

The course presents a general introduction to the relationship of structure and function in metals, ceramics, polymers, and semiconductors. Course content includes key elements relating to material structures, processes, and properties and the interrelation of these components. In addition, common materials characterization methods such as x-ray diffraction (XRD), optical microscopy, scanning electron microscopy (SEM), transmission of electron microscopy (TEM), scanning probe microscopy (SPM), and other applications in nanotechnology are introduced.

Lecture: 4, Lab 0, Other 0

## EP-446 Solid State Physics 4 Credits

Prerequisites: (MATH-204 or MATH-204H) and PHYS-362

Minimum Class Standing: Junior

Advanced course in physics of solids will be provided. Topics include: crystal lattices, reciprocal lattice vectors and momentum space, concept of the Brillouin zones, elastic waves in crystals, phonons, phonon heat capacity, density of states, free electron gas model, energy band gap and Bloch functions, Kronig-Penney model for periodic well and reciprocal space, effective mass, Fermi surfaces, semiconductors & semiconductor devices – pn junctions, LEDs and Lasers.

Lecture: 4, Lab 0, Other 0

## EP-485 Acoustic Testing and Modeling 4 Credits

Prerequisites: (MATH-204 or MATH-204H) and PHYS-302

This course combines testing and measurement in the Acoustics Laboratory, modeling approaches including the finite element method, and exposure to textbook and journal literature to explore basic phenomena in acoustics. Each time the course is offered, students and the instructor will select two modules from a larger set, so that the course may be tailored to meet the needs and interests of students and faculty. Module topics include acoustics oscillators, structural vibration, source models, three-dimensional wave propagation, impedance and intensity, and transducers. Additional modules may be offered. Students in this course will collaborate to develop understanding through lab work, modeling, and theory. Each module will culminate in a presentation.

Lecture: 2, Lab 4, Other 0